

WHAT IS CLAIMED IS:

1. A method of transferring and loading a reticle onto a receiving station, comprising the steps of:

(a) retrieving the reticle from a storage facility with an end effector having a reticle plate coupled to a mounting plate, which connects the end effector to a robotic arm;

(b) mounting the reticle on the reticle plate after the reticle has been pre-aligned in an off-line alignment station; and

(c) transferring the reticle from the off-line alignment station to the receiving station while maintaining the pre-alignment and providing rigidity during the transfer.

2. The method of claim 1, further comprising the steps of:

(d) locking the reticle plate against the mounting plate during transport of the reticle; and

(e) unlocking the reticle plate from the mounting plate during pick-up and place-down of the reticle.

3. The method of claim 1, further comprising the steps of:

(d) allowing out-of-plane motion of the reticle plate; and

(e) restricting the out-of-plane motion of the reticle plate.

4. The method of claim 1, further comprising the steps of:

(d) if a vacuum break is detected, stopping motion of the end effector; and

(e) maintaining the reticle mount.

5. The method of claim 1, wherein the reticle plate is a vacuum plate.

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6. The method of claim 5, wherein said mounting step comprises the steps of:

- (i) supplying at least one primary vacuum land on the vacuum plate from a first vacuum source; and
- (ii) supplying at least one secondary vacuum land on the vacuum plate from a second vacuum source.

7. The method of claim 1, further comprising the step of:

- (d) removing particulate contamination from the reticle.

8. The method of claim 1, wherein step (b) comprises the step of:

- (i) mounting the reticle onto the reticle plate by a solenoid driven clamp.

9. The method of claim 1, wherein step (b) comprises the step of:

- (i) mounting the reticle onto the reticle plate by an electrostatic charge placed on the reticle plate.

10. The method of claim 1, further comprising the steps of:

- (d) locking the reticle plate against the mounting plate by employing a pneumatically driven solenoid locking device during transport of the reticle; and
- (e) unlocking the reticle plate from the mounting plate during pick-up and place-down of the reticle.

11. An end effector for handling a reticle to be transported to a receiving station, comprising:

- a reticle plate having at least one seal for mounting the reticle, wherein the reticle plate also has a mounting device for attaching the reticle to the reticle plate; and
- a mounting plate coupled to the reticle plate.

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12. The end effector of claim 11, wherein the reticle plate is a vacuum plate.

13. The end effector of claim 12, wherein the vacuum plate has a first side and a second side, wherein the first side has at least one seal for mounting the reticle, and the second side has at least one vacuum land for performing a vacuuming function for reticle attachment; and

a mounting plate coupled to the second side of the vacuum plate, the mounting plate having at least one vacuum source for supplying vacuum to the at least one vacuum land.

14. The end effector of claim 13, wherein the vacuum plate further comprises:
at least one flexure located on the top surface of the reticle plate for allowing out-of-plane motion of the reticle plate, wherein the at least one flexure extends through the reticle plate and attaches to the mounting plate.

15. The end effector of claim 14 wherein the reticle plate further comprises:
at least one travel stop located on the first side of the reticle plate for constraining motion of the reticle plate, wherein the at least one travel stop extends through the reticle plate and attaches to the mounting plate.

16. The end effector of claim 11, wherein the end effector is coupled to a mounting bracket for connecting the end effector to a robot.

17. The end effector of claim 13, wherein the at least one vacuum land is a combination of secondary and primary vacuum lands.

18. The end effector of claim 11 wherein a vacuum lock is integrated between the mounting plate and the reticle plate for locking the reticle plate against the mounting plate.

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19. The end effector of claim 11, wherein a pneumatically driven solenoid locking device is integrated between the mounting plate and the reticle plate for locking the reticle plate against the mounting plate.
20. The end effector of claim 14, wherein the at least one flexure is a vertex in a triangular geometry formed by a group of flexures.
21. The end effector of claim 13, wherein the at least one seal is capable of breaking.
22. The end effector of claim 16, wherein the mounting bracket is capable of rotation at a 30 degree angle and a 40 degree angle.
23. The end effector of claim 11, wherein the reticle plate reduces particulate contamination on the reticle.
24. The end effector of claim 13, wherein the at least one vacuum source is a vacuum tube.
25. The end effector of claim 13, wherein the at least one vacuum source is a sealing channel.
26. The end effector of claim 11, wherein the reticle is mounted onto the reticle plate by a solenoid driven clamp.
27. The end effector of claim 11, wherein the reticle is mounted onto the reticle plate by an electrostatic charge.
28. An end effector for handling a reticle to be transported to a receiving station, comprising:

means for holding the reticle;
means for attaching the reticle to the means for holding the reticle; and
a means for coupling the end effector to a robotic arm.

29. The end effector of claim 28, wherein the means for holding the reticle has

a first side and a second side, said first side having a sealing means for mounting the reticle, said means for holding the reticle having at least one vacuuming means for performing a vacuuming function; and

the means for coupling the end effector to a robotic arm couples to the second side of the means for holding the reticle, wherein the means for coupling the end effector to the robotic arm has at least one vacuuming source means for supplying vacuum to the vacuuming means.

30. The end effector of claim 28, wherein the means for holding the reticle further comprises:

means for allowing out-of-plane motion of the means for holding the reticle, wherein the means for allowing the out-of-plane motion is located on the first side of the means for holding the reticle.

31. The end effector of claim 28, wherein the means for holding the reticle further comprises:

means for restricting motion of the means for holding the reticle, wherein the means for restricting motion extends through the means for holding the reticle and mounts to the means for coupling the end effector to the robotic arm.

32. The end effector of claim 28, wherein the end effector is coupled to a means for connecting the end effector to a robot.

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33. The end effector of claim 29, wherein the at least one vacuuming means is a combination of secondary and primary vacuuming means.

34. The end effector of claim 28, wherein a means for locking the means for holding the reticle against the means for coupling the end effector to the robotic arm is located between the means for holding the reticle and the means for coupling the end effector to the robotic arm.

35. The end effector of claim 30, wherein the means for allowing out-of-plane motion of the means for holding the reticle is a vertex in a triangular geometry formed by a group of means for allowing out-of-plane motion.

36. The end effector of claim 29, wherein the at least one sealing means is capable of breaking.

37. The end effector of claim 32, wherein the means for connecting the end effector to the robot is capable of rotation at a 30 degree angle and a 40 degree angle.

38. The end effector of claim 28, wherein the means for attaching the reticle reduces particulate contamination on the reticle.

39. The end effector of claim 29 wherein the at least one vacuuming source means is a vacuum tube.

40. The end effector of claim 29, wherein the at least one vacuuming source means is a sealing channel.

41. The end effector of claim 28, wherein the reticle is mounted onto the means for holding the reticle by a solenoid driven clamp.

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42. The end effector of claim 28, wherein the reticle is mounted onto the means for holding the reticle by means of an electrostatic charge placed on the means for holding the reticle.

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